

**NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION**



**2D3D
POST PROJECT REVIEW REPORT**



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Publication Date:

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2-D/3-D Orthophotography

PROJECT OVERVIEW

Surveys and Photogrammetry Section of the Design Division, is responsible for coordinating and/or conducting the preliminary surveys for the Department of Transportation and for creating right of way plats for the Department. Surveying in the Department of Transportation can be broken down into a number of different types. They are: Geodetic (first order surveys), Photogrammetric, land (Metes-and-Bounds surveys), boundary, bridge, and construction. Surveys and Photogrammetry does all of the above types of surveying except construction surveying.

To complete their assignments, they must use complex surveying and photogrammetry equipment. Because of recent engineering and surveying administrative rules changes, they are responsible for doing more work on highway projects, without increased staff to complete the tasks. Also the number of projects they are responsible to complete has increased. One area where the workload has increased is in stereoplottting. They have two stereoplotters. One is an optical plotter (P-33) and the other is a Digital plotter (ImageStation). There is only one operator that can operate the optical stereoplotter efficiently. The problem is the P-33 stereoplotter is now obsolete. If certain parts break, the stereoplotter can not be repaired due to a lack of replacement parts. If the stereoplotter operator gets sick, or leaves, the department does not have a backup person to take his place. An applicant for the position must take a stereovision test to determine if the individual can see stereo and measure accurately. A large number of applicants fail this test. If an individual is found that can accurately see stereo, it will take six (6) months or longer to train the individual to be proficient in doing this work. This type of technology is out of date. Support for optical equipment is getting scarce. The current technology is to use digital imagery on digitally capable equipment.

The Hydraulics analysis staff in the Design Division needs the ability to look at highway drainage patterns on aerial photographs in stereo. They currently can view contact prints in stereo through an instrument called a stereoscope. This instrument does not allow making measurements to determine elevations and slopes. The contact prints allow for only a fixed magnification. The magnitude of erosion problems are hard to see and determine under this system.

Imagery, in one form or another, is appearing in all geoengineering disciplines. We live in a 3-D world. We see things in 3-D, yet we are taught to convert 3-D into 2-D. This includes the design of highways. The effects of the design may not always be apparent when we do this. There is a need to work in 3-D to create better designs. This means seeing the effects of the design in 3-D on a digital stereo photo image.

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PROJECT OBJECTIVES

PROJECT DESCRIPTION:

To purchase hardware and software needed to migrate from optical mensuration to digital mensuration in Surveys and Photogrammetry. To provide Surveys and Photogrammetry with needed 3-D capabilities to complete highway projects sooner and replace outdated stereoplotters equipment. To provide the Design Division tools to benefit from the byproducts and capabilities available in Surveys and Photogrammetry. This will be done through the following purchases.

1. To purchase seven (7) Z/I Imaging SSK softcopy kit workstation add-on equipment and software to seven (7) existing CADD workstations. Three (3) are for Surveys & Photogrammetry, two (2) are for hydraulic analysts, and two (2) are for designers.
2. To purchase seven (7) CRT monitors for the above listed workstations.
3. To purchase a network license for thirty (30) Z/I Imaging “Image viewer” software packages, to be used on existing CADD MicroStation workstations in Design and Bridge Divisions to provide image back-drop for screen-based digitizing and vector update.
4. To purchase Z/I Imaging “GeoMedia Terrain” software to be used on Surveys & Photogrammetry’s existing ImageStation workstation

USER RESPONSE

1. The new system has increased productivity and capabilities. The system allows feature collection capability minimizes the interaction required to collect or edit feature data, with easy-to-use command menus and data forms. A user-definable feature table lets you define graphic characteristics that are automatically activated when selecting a feature to digitize.
2. The CADD editors will have the ability to check problem areas where the data is unclear. This will help the stereoplotters operators, in that they will not have to stop working on a project and start on the project that the CADD editor has a problem with.
3. The CADD editors have the ability to add data to existing project digital data that is requested by the highway designers.
4. The CADD editors have the ability to act as backup stereoplotters operators in time of need, such as a need for a rush project.
5. The hydraulic analyst have the ability to make better decisions on hydraulic problem areas, because they will be able to see drainage patterns in 3-D, more accurate areas, slopes, and elevations can be determined.
6. The highway designers have ability to make better highway designs, because they will be able to see the effects of their created designs by using 3-D digital images

LESSONS LEARNED

That technology changes rapidly. Therefore, problems may create delays in installation of hardware and software

PROJECT SYNOPSIS

CONCLUSION

This project now gives us the following capabilities:

1. Replacement for existing optical stereoplotter – The stereoplotter operator is able to work with digital images. This increases productivity and capabilities. We are able to continue the stereoplotter operations if the optical stereoplotter breaks down or the operator gets sick or leaves the DOT. The optical stereoplotter will be used only for work on projects that are currently started on or old completed projects that need updating.

Capturing feature data from stereo aerial imagery is one of the most time-consuming photogrammetry tasks. In fact, thousands of actions a day may be performed in this operator-intensive process. The feature collection capability minimizes the interaction required to collect or edit feature data, with easy-to-use command menus and data forms.

2. Increased capabilities for CADD editors – The CADD editors have the ability to check problem areas where the data is unclear. This helps the stereoplotter operators, in that they do not have to stop working on a project and start on the project that the CADD editor has a problem with.

- The CADD editors have the ability to add data to existing project digital data that is requested by the highway designers.
- The CADD editors have the ability to act as backup stereoplotter operators in time of need, such as a need for a rush project.

3. Increased capabilities for hydraulic analysts – The hydraulic analyst is able to make better decisions on hydraulic problem areas, because they are able to see drainage patterns in 3-D, more accurate areas, slopes, and elevations can be determined.

4. Increased capabilities for highway designers – The highway designers are able to make better highway designs, because they are able to see the effects of their created designs by using 3-D digital images.

Project Time Lines:

The project timeline needed to be adjusted by a couple of months due to the change in hardware.

The original graphics card used to run the Intergraph software would not work in the new generation computers. The outdated graphics card was a 3D Labs Wildcat 7110. A new graphics card had to be purchased. This card is a 3D Labs Realism 800. New computers with the PCI express slot had to be purchased.

The Realism 800 card driver did not work properly with the installed software on the new computers. It took months for 3D Labs to discover the problem and fix their software driver

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Total Project Costs:

UNITS	PART NUMBER	DESCRIPTION	UNIT PRICE	COST
30	SFT00446	Image viewer software	\$495	\$14,850
4	SFC00700	SSK Standard configuration Included software: ImageStation Photogrammetric Manager ImageStation Stereo Display ImageStation Feature Collection Included hardware: Wildcat 7110 Graphics card Stereo sync wireless glasses SSK 3D Softmouse with interface 5 volt power supply Stereo Emitter	\$19,500	\$78,000
3	SFC00800	SSK PRO Standard configuration The included hardware & software is the same as the SSK standard configuration shown above plus the following additional software: ImageStation Model Setup ImageStation DTM collection	\$28,500	\$85,500
7	DP2070SB-BK	22" (or larger) CRT Monitors with @ least 120 Hz refresh rate.	\$700	\$4,900
1	SJBX878AA-0502A	Geomedia Terrain	\$3,000	\$3,000
1		Freight charges (Actual cost)		
TOTAL HARDWARE & SOFTWARE COSTS				\$186,250
MAINTENANCE COST/FIRST YEAR				
UNITS	PART NUMBER	DESCRIPTION	UNIT PRICE	ESTIMATED COST
30	SFT00446	Image viewer software maintenance/first year	\$84	\$2,520
1	SJBX878AA-0502A	Geomedia Terrain maintenance/first year	\$612	\$612
TOTAL FIRST YEAR MAINTENANCE COSTS				\$ 3,132
GRAND TOTAL				\$189,382

MAINTENANCE COST/YEAR (after first year)

UNITS	PART NUMBER	DESCRIPTION	UNIT PRICE	COST
30	SFT00446	Image viewer software maintenance/first year	\$84	\$2,520
4	SFC00700	SSK Standard configuration maintenance/first year	\$3,120	\$12,480
3	SFC00800	SSK PRO Standard configuration maintenance/first year	\$4,560	\$13,680
1	SJBX878AA-0502A	Geomedia Terrain maintenance/first year	\$612	\$612
TOTAL YEARLY MAINTENANCE COSTS				\$ 29,292

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Future Considerations:

Items\Concepts that were discussed during this project, but were not within the scope of this project were:

- **Expand to more employees.**
- **Have consultants produce in same format.**

PROJECT SIGN-OFF

The DOT Information Technology Division and the Information Technology Department have completed all requests and assignments.

I have reviewed the 2D3D Orthophotography Project for the North Dakota Department of Transportation, and agree with the fulfillment of the project as stated in the scope and deliverables of the project.

I endorse and authorize the completion of the project:

Signature	Date
<div>_____</div> <div>Mark Gaydos P.E. Design Engineer</div>	<div>_____</div>
<div>_____</div> <div>Doug Faiman IT Director</div>	<div>_____</div>

Comments: